ISSUE 6

CaH2Net Update

SPRING 2008

THE CAH2NET— MOVING FORWARD

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Calendar Year 2007 marked the second full year of CaH2Net program activities, and was defined by a number of successes and challenges. The successes helped propel the program toward its goal, and the challenges offered the program the opportunity to refine priorities and make adjustments that will help the program better achieve success moving forward. On the whole, progress during 2007 helped move the program toward achieving its goal of enabling a network of hydrogen stations and vehicles in California.

Program Successes

Successes in 2007 were characterized by a refining of program priorities, placement of next generation fuel cell vehicles, the opening of new hydrogen stations, and funding for fuel cell transit buses.

Based on feedback from the CaH2Net Advisory Panel and program stakeholders at a forum in January of 2007 held by the Air Resources Board (ARB), a strategic refocusing of the program's infrastructure deployment strategy was initiated. The refined strategy put additional emphasis on creating clusters of hydrogen fueling stations in the key urban areas of Los Angeles and San Francisco. Automakers worked with CaH2Net program staff to identify critical placement of stations to create "mini-networks" able support near-term fuel cell vehicle deployments.

During 2007, a number of the major automakers announced details of plans for placement of fuel cell vehicles with customers in these key markets, including GM and Honda. In addition, these next generation vehicles showed tremendous technical advances over their previous generation in terms of driving range (250 – 350 mile), power density, cost, durability, and weight. As an example, the fuel cell stack in Honda's FCX Clarity is 30% lighter, 20% smaller, has a power density improvement of 50%, and a 30% increase in driving range to 270 miles.

On the infrastructure side of the equation, 2007 initiated a move to 700 Bar (10,000 psi) fueling. Acknowledging that an increase in fueling pressure to 700 Bar would enable greater driving range, the first 700 Bar fueling station in the Hydrogen Highway Network opened in February of 2007. Located in Irvine at UC Irvine, and a project of the National Fuel Cell Research Center, Air Products, Department of Energy (DOE) and the South Coast Air Quality Management District (SCAQMD), the station is operational and fueling Toyota, GM and Honda fuel cell vehicles. Additionally, the Burbank hydrogen station was selected for an upgrade to 700 Bar fueling and in May of 2007 a new hydrogen station was opened in Rosemead at SoCal Edison, part of a project by Chevron, Hyundai, DOE and

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Honda Clarity Fuel Cell Vehicle

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UTC. Additionally in 2007, ground was broken on California's first fully public, retail hydrogen station. Located at an existing Shell station in West Los Angeles, this station is slated to open in the Spring of 2008. Sacramento is also now home to a 100% renewable hydrogen station. BP in partnership with Ford and the Sacramento Municipal Utility District (SMUD) opened this station in March 2008.

Finally, during FY2007 the CaH2Net program funded hydrogen and fuel cell bus programs throughout the state supporting 15 buses in seven California communities. This support highlights the importance of hydrogen and fuel cells in transit applications to achieve significant reductions in emissions, noise, and exposes greater numbers and a more diverse cross section of the public to hydrogen and fuel cell technologies.

Program Challenges

The challenges encountered in 2007 generally stem from a lack of interest in State incentives on the part of traditional fuel providers due to perceived challenges of contracting with the State. Unfortunately, none of the major energy companies involved in the CaH2Net or with hydrogen activities in the State opted to respond to program incentives for developing hydrogen fueling infrastructure in California. As a result, in 2006, all three of the awards were made to non-traditional fuel providers. The State awarded co-funding to three contractors through a public process for three hydrogen fueling stations in the San Francisco, Los Angeles, and San Diego areas. Two of the awards were to public entities, specifically Cal State University Los Angeles and San Diego City Schools, both of which encountered significant contracting challenges resulting in the withdrawal of both awards. The third station award, to Pacific Gas & Electric, has undergone some modifications to the project scope but is moving forward. A key lesson learned from this experience is the need for the CaH2Net to have the ability to award grants rather than contracts for deployment of infrastructure.

Fortunately, all of the funding that was not used for hydrogen stations in 2006 has been rolled into a new $7.7 million Request for Proposal. The ARB is confident that taking the lessons learned from the first attempt to fund stations will result in a successful round of bids and station deployments this second time around.

ARB RELEASES $7.7 MILLION RFP FOR H2 STATIONS

The Air Resources Board (ARB) is pleased to issue Request For Proposal (RFP) 06-618 that will "Establish Demonstration Hydrogen Refueling Stations". The ARB is seeking competitive bids from experienced and qualified teams to design, build, operate and maintain renewable hydrogen refueling stations to serve as part of California's Hydrogen Highway Network. The funding is for public stations.

The maximum total amount of the funding is $7.7 million with individual funding amounts ranging from $550,000 for a station upgrade, to $2.7 million for a 100% renewable hydrogen station that dispenses both 5000 and 10,000 psi hydrogen. Not only does this RFP offer higher funding levels than previously , ARB staff will be able to run the Greenhouse Gases, Regulated Emissions and Energy Use in Transportation (GREET) model to help determine if the station design meets the environmental requirements of the station, early in the proposal process. This way the station design may be fine tuned if it falls short in any emissions category. The RFP is available online at: http://www.cscr.dgs.ca.gov/cscr/ . Proposals are due to the ARB by 3:00 p.m. June 13, 2008.

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ARB PASSES NEW ZERO EMISSION VEHICLE AMENDMENT

On March 27, 2008 the Air Resources Board voted to triple the amount of zero emissions vehicles that staff had proposed for automakers to produce from 2012 through 2014, while directing staff to look at overhauling the program to account for climate change benefits.

Staff had proposed to require 2,500 pure zero emission vehicles, which the Board increased to 7,500. Automakers can produce fewer ZEVs, 5,357, if they are long-range fuel cell vehicles or they can opt to satisfy the requirement by manufacturing 12,500 battery electric vehicles with a range of 100 miles.

The Board maintained a second component of the vehicle emissions reduction program that allows the automakers flexibility in their alternative fuel programs by requiring an additional 58,000 plug-in hybrids during that same period. If the automakers produce 25,000 ZEVs, there are no remaining plug-in hybrid requirements.

Additionally, ARB Chairman Mary Nichols directed staff to overhaul the ZEV program for 2015 vehicles to synch up with other Board tailpipe emission programs such as the Pavley regulations addressing greenhouse gas emissions and the low emissions vehicle program.

“Today's decision will lead to more green auto choices for consumers now while keeping the pressure on the automotive engineers to continue fine tuning the technologies that will yield an all electric-drive vehicle fleet for California in the near future,” Nichols said. “We must continue to push for all types of technologies -- fuel cells, electric vehicles and hydrogen powered cars -- as we fight our duel battles against smog and global warming.”

Created in 1990, the ZEV program seeks to spur technological advancements in the automobile industry that lead to more clean cars on California’s roadways. The ZEV program is the world’s only enforceable requirement for development and production of zero emissions vehicles.

As a direct result of the ZEV program, over 750,000 Californians are currently driving vehicles with near-zero emissions and an extended emissions warranty of 15 years or 150,000 miles. They are 80 percent cleaner than the average 2002 model year car. The Board’s action will assure many more near-zero and zero emission vehicles on California's roads in the near future.

For more information, contact Ms. Elise Keddie at (916) 323-8974

ENVIRONMENTAL STANDARDS FOR HYDROGEN PRODUCTION

Senate Bill 1505 requires ARB to develop regulations for environmental standards of hydrogen production. The regulation will require producers of hydrogen transportation fuel to reduce criteria pollutant and greenhouse gas (GHG) emissions relative to that of gasoline and gasoline-powered vehicles. The regulation will also require that a percentage of the hydrogen produced for transportation be made from eligible renewable energy resources.

Initially, only hydrogen stations funded by the state will be mandated to meet the requirements. The requirements will apply to all producers after 3,500 metric tons of hydrogen is dispensed for transportation statewide in a one year period.

If all hydrogen stations were to meet the emissions requirements, the reduction in well-to-wheel GHG emissions compared to gasoline vehicles would be over 25,000 tons and the well-to-tank reduction in criteria pollutants, specifically Oxides of Nitrogen and Reactive Organic Gases, would be over 2 tons. The regulation will also require hydrogen producers to ensure at least 33.3 percent of transportation hydrogen be made from eligible renewable energy resources. These requirements are intended to ensure that, as California transitions from a petroleum dominated transportation system to an alternative fuels system, it does so in an environmentally friendly manner without increasing emissions. Finally, the regulation will help ensure the increased use of and demand for renewable resources in the transportation sector.

Currently the regulation is undergoing public workshops and development. The next workshop is scheduled for April 7, 2008, and the Board Hearing is scheduled for June 2008.

To find out more, contact Ben Deal at (916) 322-8449.

HYDROGEN'S BENEFITS AS FUEL BECOMING OBVIOUS

By Mary D. Nichols

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As we continue to battle smog and soot in too many parts of the state and as gas continues to creep toward $4 a gallon, Gov. Arnold Schwarzenegger's Hydrogen Highway is looking more like the future of transportation in California. While hydrogen vehicles are still in the early stages of deployment and fuel production is costly, the partnership of auto manufacturers, fuel suppliers and related government agencies is strong.

Hydrogen has the potential to offer monumental benefits by reducing both health-damaging pollutants that create smog and greenhouse gas emissions. When hydrogen is produced by renewable energy such as solar, wind or biomass, it is nearly pollution-free and has little impact on the environment. Even when produced from natural gas, as most hydrogen is today, the reduction in greenhouse gases and pollution is substantial.

Since 2000, automakers have placed more than 175 vehicles, traveling more than 1 million miles, on California roads. More hydrogen vehicles are now registered here than in any other state or country in the world, and we have more fueling stations than any other state. Combined with other emerging alternative fuel technologies - including hybrids, battery electric and compressed natural gas vehicles - the picture looks even more impressive. This state is working aggressively with its partners to wean ourselves off petroleum.

Californians should look ahead with optimism to greater numbers of hydrogen vehicles and stations in the Golden State. We have strong commitments and working relationships with all of the crucial parties that need to be involved: energy companies, automakers, state and federal government, academia and the environmental community. The California Fuel Cell Partnership in West Sacramento consists of 33 organizations that believe fuel cell vehicles powered by hydrogen have the potential to change the future of transportation.

California is the hub for hydrogen vehicle research and development projects. Due to substantial investments by the automotive industry, fuel cell vehicles have made remarkable technical progress in the areas of efficiency, range, cost and durability. For example, the Honda's FCX Clarity fuel cell vehicle has a range of more than 250 miles, which already meets the Department of Energy's 2010 goal.

Energy companies have also made substantial investments in multiple hydrogen production and delivery options and now believe that clean hydrogen fuel can be offered at competitive prices to fuel cell consumers when they are commercially deployed. With vehicle efficiency accounted for, analysts project hydrogen costs comparable to $1.50 a gallon of gasoline. It's also worth noting that - contrary to public perception - hydrogen as a fuel source is at least as safe as gasoline and the safety record of the industry is impeccable.

The hydrogen program has been remarkably successful at getting the most for a relatively small state investment: We have invested $25 million in the Hydrogen Highway since 2005 while automakers have spent upward of $300 million a year on vehicle research, development and demonstration.

The next several years will usher in an exciting new area in the use of hydrogen as a fuel source:

- GM will introduce over 100 vehicles nationwide, 60 of which will be placed in Southern California. They will be leased to private parties and municipalities.
- The Sacramento Municipal Utilities District and BP are opening a 100 percent renewable photovoltaic hydrogen station in Sacramento.
- Honda will later this year begin leasing its new Clarity to private citizens in Southern California.
- Several hydrogen fuel cell-powered transit buses are already operating as pilot projects in the Bay Area.

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PROJECT DRIVEWAY LETS CONSUMERS BE PART OF SOMETHING BIG

Getting behind the wheel of the Chevrolet Equinox Fuel Cell electric vehicle isn't an average test drive, but it's one that some Californians have already experienced. They have raised their hands for Chevrolet's "Project Driveway" — the largest market test of fuel cells ever — and their feedback could help shape the very future of automotive transportation.

Most Project Driveway participants say they signed up to make history, to test advanced technology, and to do their part to make the world a better, cleaner place.

"I have the distinct honor of venturing into new territory with the promise of a better way of life and the certainty that others will soon follow," said Davi Kutz, a web designer from North Hollywood, California. Kutz said he's excited about being what he calls a pioneer: "For the first time, I realize how it must feel to make history."

Project Driveway hand raisers in greater New York City, Los Angeles, and Washington D.C. have begun to take delivery of the petroleum-free, zero emission Chevrolet Equinox Electric Fuel Cells. Each driver will spend up to three months chronicling real-world experiences such as going to work, driving carpool, and even refueling. GM engineers and marketers are very interested in determining what customers like — and don't like — about electrically driven vehicles.

California was one of the three markets chosen for Project Driveway for a number of reasons: It's an important area for influencing necessary public policy; potential early adopters live in California; and some hydrogen refueling stations and service facilities already exist. Chevrolet will be deploying 50 Equinox Fuel Cell vehicles in California as part of Project Driveway. General Motors is also in the process of placing temporary 10,000 PSI (700 Bar) hydrogen fueling stations in southern California for the Project Driveway vehicles.

More than 50,000 people have visited Chevrolet's website www.chevrolet.com/fuelcell/signup to sign up. Drivers must be licensed and at least 21, with a good driving record, to participate.

Project Driveway test drivers work with specially trained Chevy Driver Relationship Managers (DRMs), who provide education and support. The DRM oversees the delivery process as well as all training, including refueling guidance.

Every single aspect of the Project Driveway experience — from the use of the vehicle to the hydrogen fuel and even the insurance — is free of charge in exchange for drivers providing invaluable insight into the details of their overall experience with this innovative vehicle.

Project Driveway customers driving the Chevrolet Equinox Fuel Cell Vehicle

"I have the distinct honor of venturing into new territory with the promise of a better way of life……," said Davi Kutz, a web designer from North Hollywood, California.

Project Driveway customers with their new Chevrolet Equinox Fuel Cell Vehicle

HYDROGEN STATIONS STEPPING UP TO MEET CUSTOMER NEEDS

Focusing hydrogen stations on areas with hydrogen cars is a key to the success of hydrogen as a transportation fuel. To accomplish this, a number of stations have stepped up to meet the immediate needs of existing and expanding fuel cell vehicle fleets. These stations are increasing dispensing capacity and pressure, providing hydrogen to vehicles beyond dedicated fleets, and integrating renewable resources into hydrogen production.

The National Fuel Cell Research Center celebrated the opening of its public hydrogen fueling station on the UC Irvine campus in February 2007 and is offering hydrogen at 350 and 700 bar. The City of Burbank is in the process of replacing its 12 kg/day electrolyzer with a natural gas reformer station capable of dispensing 100 kilograms per day at 350 and 700 bar. These stations, along with others in the Los Angeles/Orange County area will help satisfy the hydrogen fuel needs of an increasing population of fuel cell vehicles, including 60 Chevy Equinox fuel cells being deployed as part of Project Driveway.

The city of Long Beach recently opened a mobile refueler in partnership with the South Coast Air Quality Management District (SCAQMD) to support the Department of Energy Technology Validation project. The Long Beach station, SCAQMD's electrolyzer station in Diamond Bar, and Sunline Transit Agency's reformer station in 1000 Palms are providing fuel to all customers enabling auto manufacturers to broaden vehicle usage and test their vehicles in high temperature extremes. As an added environmental benefit, both SCAQMD and Sunline support their hydrogen production with renewable electricity.

Energy providers have also been adding some flare to the hydrogen infrastructure. BP, in partnership with Ford and the Sacramento Municipal Utility District (SMUD), recently opened an attractive electrolysis station operating almost completely on photovoltaic panels that shade the parking structure surrounding the station. This station with its easy freeway access, no security fencing, and simplified touch screen dispenser has made a significant step toward a "retail-like experience."

Shell Hydrogen is taking it one step further by adding a hydrogen dispenser at their gasoline station in West LA. This station, set to open in May 2008, will be a popular stop for Southern California's fuel cell vehicle fleet.

As of spring 2008, there are 29 public, private and research hydrogen fueling facilities operating in California. Several more are in the planning stages, many of which are seeking funding. While a most of the existing stations are either sized for and limited to small vehicle fleets, future hydrogen stations in California cater to diverse customer fleets in more retail-like settings.

National Fuel Cell Research Center Hydrogen Station at UC Irvine

For more information, contact Leslie Goodbody at (916) 323-2961.

SMUD's solar hydrogen fueling Station in Sacramento

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HYDROGEN BUSES MAY BE COMING TO YOUR NEIGHBORHOOD

Zero emission hydrogen transit buses play an important role in achieving the State's goals for air quality, global warming and energy security. Transit agencies are also a great place to test new technologies since they have centralized fueling and fixed routes. In addition, the buses get a lot of exposure to the public. Because of these benefits, the fiscal year 2006-2007, ARB budget contained $5 Million for hydrogen transit buses. In addition, the budget included another $2 million from the Alternative Fuel Incentive Program (AFIP). From these combined funds, four transit bus projects were selected:

- Sunline's American Fuel Cell Bus Project in the Palm Springs area.
- Sunline's Thor Fuel Cell Bus Project also in the Palm Springs area.
- Burbank's Fuel Cell Bus Project.
- Zero Emission Bay Area Project which coordinates five bay area transit operators' efforts to demonstrate a fleet of 12 fuel cell buses.

All buses will be placed in revenue service, used on regular transit routes, and will operate full shifts. So far, the transit agencies using hydrogen buses have had enormous success with the buses popularity. People will often wait to ride a hydrogen bus over the diesel bus since it is so quiet and pleasant to ride. For more information, contact Lesley Crowell (916) 323-2913.

One of AC Transit's Three Operating Fuel Cell

THE STATE'S HYDROGEN VEHICLES AND SHUTTLES ARE HITTING THE STREETS

The State's hydrogen vehicles and shuttle buses are hitting the streets. The state has leased two Ford E450 shuttle buses for two years. Each bus is capable of carrying up to 12 passengers and has a range of 150 miles. One bus was delivered to the County of San Mateo in November of 2007 and is being used to link local business employees to the CalTrain public transportation network. The second bus will be used by the City of Chula Vista in Southern California and should be placed there by this summer.

The ARB has also leased four Toyota Prius' that have been converted to operate on hydrogen. Over the two -year lease period, one vehicle will be used by the Schatz Energy Research Center at the Humboldt State University, two will be located in the greater Sacramento region and the fourth will be located in Southern California. Delivery of the four Prius' is expected this summer.

The ARB has also leased one fuel cell powered GM Equinox for one-year. This car was delivered to UC Irvine in February and will be used for technology evaluation and outreach.

For more information, contact Craig Duehring (916) 323-2361.

Ford E450 hydrogen shuttle bus, now part of San Mateo's transit fleet

www.HydrogenHighway.ca.gov

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The California Hydrogen Highway Network is an initiative to establish hydrogen infrastructure to support commercialization of sustainable, zero and near zero emission hydrogen vehicles.

The CaH2Net is a key part of California's strategy to achieve the State's vision of a secure energy future that simultaneously addresses our environmental, public health and economic challenges working in partnership with other components of the State's programs to advance energy efficiency and renewable energy.

HYDROGEN'S BENEFITS AS FUEL BECOMING OBVIOUS

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- For our part, the Air Resources Board will release a request for proposals for $7.7 million for three new hydrogen stations and upgrades that will increase the capacity of two existing stations. We have also unveiled a rebate program for Californians buying certain models of alternative fuel vehicles.

Realizing the vision for a clean transportation future will take the sustained efforts of all partners, and we will certainly experience many bumps along the way. We anticipate fuel cell commercialization to occur sometime early in the next decade. And much more progress by the vehicle and infrastructure providers and the state will be needed to make this happen. The challenge before us is to chart a path that recognizes the realities and difficulties in transforming our energy system from one dependent on polluting sources of energy to one that can take full advantage of clean, renewable sources. We are confident that California is up to the challenge.

MARY D. NICHOLS chairs the California Air Resources Board. She wrote this article for the Mercury News.